

NASA TECH BRIEF

NASA Pasadena Office



NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

Trigger Circuit Forces Immediate Synchronization of Free-Running Oscillator

The problem:

Many devices powered by an externally-synchronized inverter require it to operate without loss of synchronism. One example is the 2,400-Hz inverter flown on spacecraft, powering onboard gyroscopes, flight data subsystems, science data tape recorders, and telemetry systems. Any glitch fouling inverter synchronization could result in loss of significant data, a condition most likely to occur during periods of power source switchover from one unit to another.

The solution:

The free-running frequency of a new integrated-circuit (IC) oscillator may be higher, lower, or the same as that of the sync pulse and is always synchronized by the first clock pulse.

How it's done:

The oscillator is shown in Figure 1. The input triggering from the clock source resets the charge level on the timing capacitor C to a fixed positive level above ground potential. When transistor Q_1 is cut off, the oscillator operates in the free-running mode. Back-biased diode D_1 isolates the oscillator from spurious transients.

A negative-going clock pulse applied to the base of Q_1 turns it on. Capacitor C is charged from supply voltage V_S through D_1 and resistor R_1 . The charge on the capacitor rises to voltage level V_R . This occurs regardless of the previous charge level on the capacitor. Since V_R is initially set at a level higher than V_{A1} (Figure 2), the output voltage shifts to ground potential. After passage of the clock pulse, the capacitor discharges to V_{A0} , causing the output

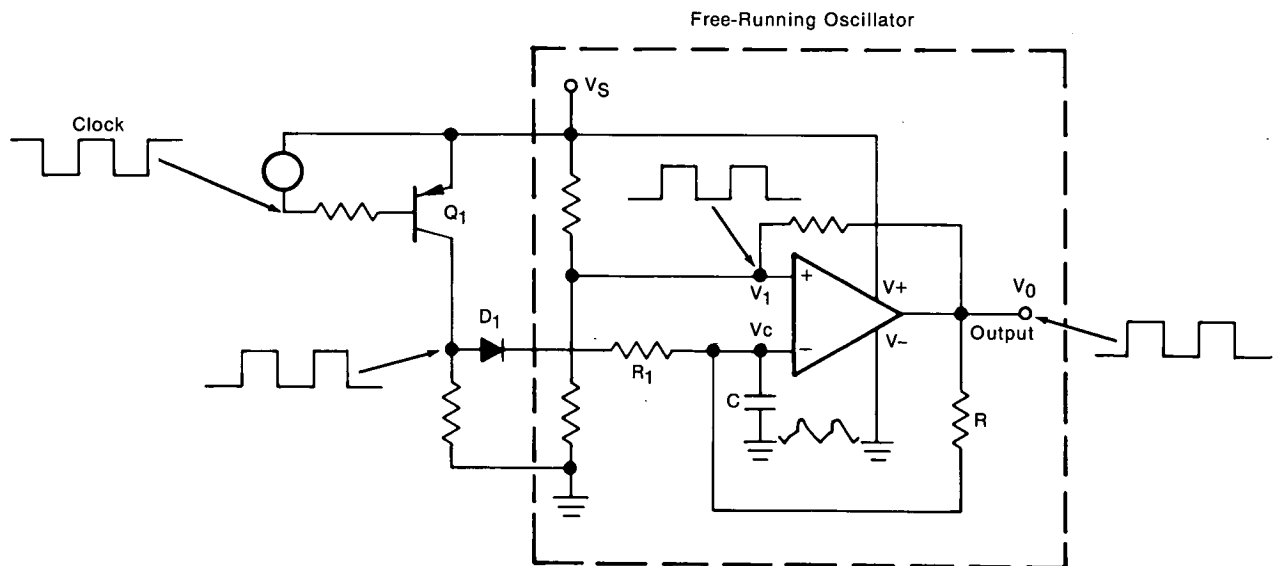


Figure 1. Trigger Circuit Forces Immediate Synchronization of Free-Running Oscillator

(continued overleaf)

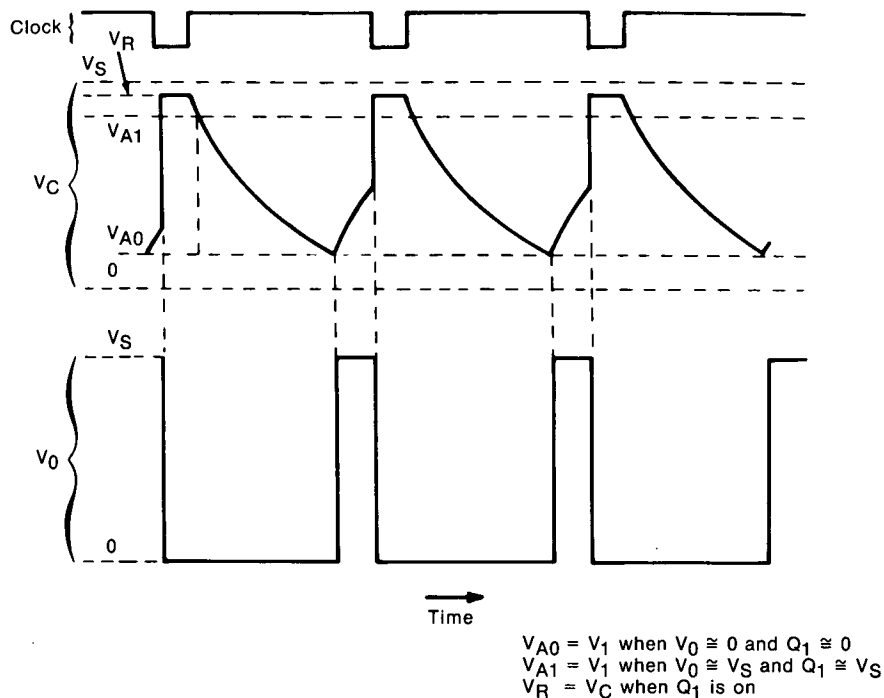


Figure 2. Synchronization Waveforms of Free-Running Oscillator

voltage to shift up to a level almost that of V_S .

The output voltage is driven to ground on the next negative-going clock pulse, and the cycle repeats. Applications of positive triggering may be useful in TV-camera and other circuits, for video recording, facsimile transmission and reception, and uninterruptible power supplies.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
 NASA Pasadena Office
 4800 Oak Grove Drive
 Pasadena, California 91103
 Reference: TSP75-10337

Patent status:

NASA has decided not to apply for a patent.

Source: Satoshi Nagano of
 Caltech/JPL
 (NPO-13646)